

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

BEM1034 – MATHEMATICS FOR ECONOMICS

(All sections / Groups)

31 MAY 2019
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FOUR (4)** printed pages excluding cover page.
2. Answer **ALL FOUR (4)** questions.
3. Please write all your answers in the Answer Booklet provided.
4. Selected mathematical formula are provided at the end of the question paper.

QUESTION 1 (25 MARKS)

(a) Solve $5 + (3)4^{x-1} = 12$

(6 marks)

(b) Find x if $(25)^{x+2} = 5^{3x-4}$

(4 marks)

(c) The projected population P of a city is given by:

$$P = 100,000e^{0.05t}$$

where t is the number of years after 1990. Predict the population for the year 2010.

(2 marks)

(d) State whether $x = 2$ is the discontinuity point for:

$$f(x) = \begin{cases} x^2 + 1 & \text{if } x > 2 \\ 8x & \text{if } x < 2 \end{cases}$$

and show that $\lim_{x \rightarrow 2} f(x)$ does not exist.

(6 marks)

(e) Is $x = 0$ discontinuity point for:

$$f(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ -1 & \text{if } x < 0 \end{cases}$$

(4 marks)

(f) Find the limits of $\lim_{x \rightarrow 4} \frac{x^2 - 9x + 20}{x^2 - 3x - 4}$

(3 marks)

Continued...

QUESTION 2 (25 MARKS)

- (a) Consider the following system of equations:

$$\begin{cases} x + 2y = 5 \\ 3x + 7y = 18 \end{cases}$$

Solve the above system using an inversion of matrix method.

(5 marks)

- (b) Given the technology matrix, A and the final demand vector, D as below:

	Grain	Fertilizer	Cattle				
$A =$	$\begin{bmatrix} 0.05 & 0.25 & 0.34 \\ 0.33 & 0.10 & 0.12 \\ 0.19 & 0.38 & 0 \end{bmatrix}$	$D =$	$\begin{bmatrix} 1800 \\ 200 \\ 900 \end{bmatrix}$	<table border="0"><tr><td>Grain</td></tr><tr><td>Fertilizer</td></tr><tr><td>Cattle</td></tr></table>	Grain	Fertilizer	Cattle
Grain							
Fertilizer							
Cattle							

Determine the total demand, X for industries Grain, Fertilizer and Cattle. Apply $X = (I - A)^{-1} D$ formula and leave your answer in two decimal points.

(20 marks)

QUESTION 3 (25 MARKS)

- (a) Find $\frac{dy}{dx}$ for $3x^2 - xy + 3y = 7$ using implicit differentiation.

(7 marks)

- (b) Differentiate $y = x^x$.

(4 marks)

- (c) Solve $\frac{dy}{dx}$ if $x = 2t - \frac{1}{t}$ and $y = t + \frac{4}{t}$ where $t \neq 0$.

(6 marks)

Continued...

- (d) Suppose the quantity demanded, q and the unit price, p for a certain commodity are related by the linear equation:

$$q = 240 - 2p$$

- i. express the elasticity of demand as a function of p . (2 marks)
- ii. Is the demand elastic or inelastic at $p = 100$? (3 marks)
- iii. State whether the demand elastic or inelastic at $p = 50$. (3 marks)

QUESTION 4 (25 MARKS)

- (a) Solve $\int e^{-3x+5} dx$ (4 marks)
- (b) Evaluate $\int_0^1 xe^{-x} dx$ (6 marks)
- (c) If $f(x, y) = (2x^2y + 3xy^2)e^{5xy}$, compute $f_x(1,1)$ and $f_y(1,1)$. Provide your answers in two decimal points. (8 marks)
- (d) The demand equation for a product is:

$$q = 10(100 - p)^2$$

where q is unit price in Ringgit Malaysia and p is the quantity demanded, calculate consumers' surplus under equilibrium which occurs at a price MYR 84.

(7 marks)

End of Page.

Formula

1. Input-Output Model

$$(I - A)X = D$$

where A is the input-output matrix, D is the external or final demand and X is the production level.

2. Total differential (change)

If $z = f(x, y)$, then the total change is $dz = f_x dx + f_y dy$

3. Implicit function rule

For a function $f(x_1, x_2, \dots, x_n, y)$, $\frac{dy}{dx_i} = -\frac{f_{x_i}}{f_y}$

4. Elasticity of demand

$$\varepsilon_d = -\frac{dq}{dp}\bigg|_{(q,p)} \cdot \frac{p}{q}$$

5. Consumers' Surplus (CS) and Producers' Surplus (PS)

$$CS = \int_{\bar{p}}^{p_0} D(p) dp$$

$$PS = \bar{p}\bar{x} - \int_0^{\bar{x}} S(x) dx$$

where \bar{p} is the unit market price, \bar{x} is the quantity sold, D is the demand function and S is the supply function.